VNG International

Setting up adequate Solid Waste Management in Pathein, Myanmar

Abstract

This policy report takes stock of the waste management governance landscape in Pathein, the capital of the Ayeyarwady region in Myanmar, and compares it to both national and international contexts. Pathein is not unique in most of the challenges it faces, including low funding and low human resource capacity in the local municipal government, which leads to a dearth of empirically grounded policy planning. After giving an overview of waste management practices in Ayeyarwady and Pathein, the report provides a detailed breakdown of key waste management indicators for the city together with a comparative analysis. Pathein's waste generation rate is relatively high for secondary cities in Myanmar and similar cities in neighbouring countries, ostensibly due to its rapidly growing economy and population. Nevertheless, it still falls far below the rate of Myanmar's primary cities which indicates that local stakeholders have a moment of opportunity for reforming solid waste management and planning. The report then situates these findings in context of current SWM development initiatives, chiefly the DEALS City programme pilot interventions. Using lessons from the pilot programme and expert insight, the report then highlighting three priority areas for improving SWM governance in Pathein: (i) divert organic waste, (ii) improve municipal waste collection systems, and (iii) develop better data collection and management processes together with KPIs.

* Note: This report was compiled and written in the two months leading up to the military coup in Myanmar on February 1st, 2021. The coup has triggered significant social and economic turmoil and may moreover herald significant changes in local government structures of Myanmar, which are not reflected in this report.

Content

1 Introduction

1.1 Global and National SWM Context

Solid waste is a mounting problem across the world due to its social, environmental and economic impacts. Setting up adequate Solid Waste Management (SWM) infrastructure is expensive, and is often the single-highest expense for municipal governments in lower-income countries.[1] It also requires significant human resources and capacity to plan and implement SWM improvements. This is particularly challenging for emerging economies like Myanmar, where urban migration and rising income levels have been accompanied by higher waste generation per capita; according to a recent meta-study, the average urban waste generation in Myanmar had reached 0.58 kilograms per capita per day (kg/capita/day) in 2020, with primary cities (Yangon and Mandalay) averaging at 0.71kg/capita/day (by comparison, some source estimate a national average rate of 0.44kg/capita/day in 2014).[2] Cities that are unable to cope with current waste levels will struggle even more in the future as both population and waste generation rates rise.

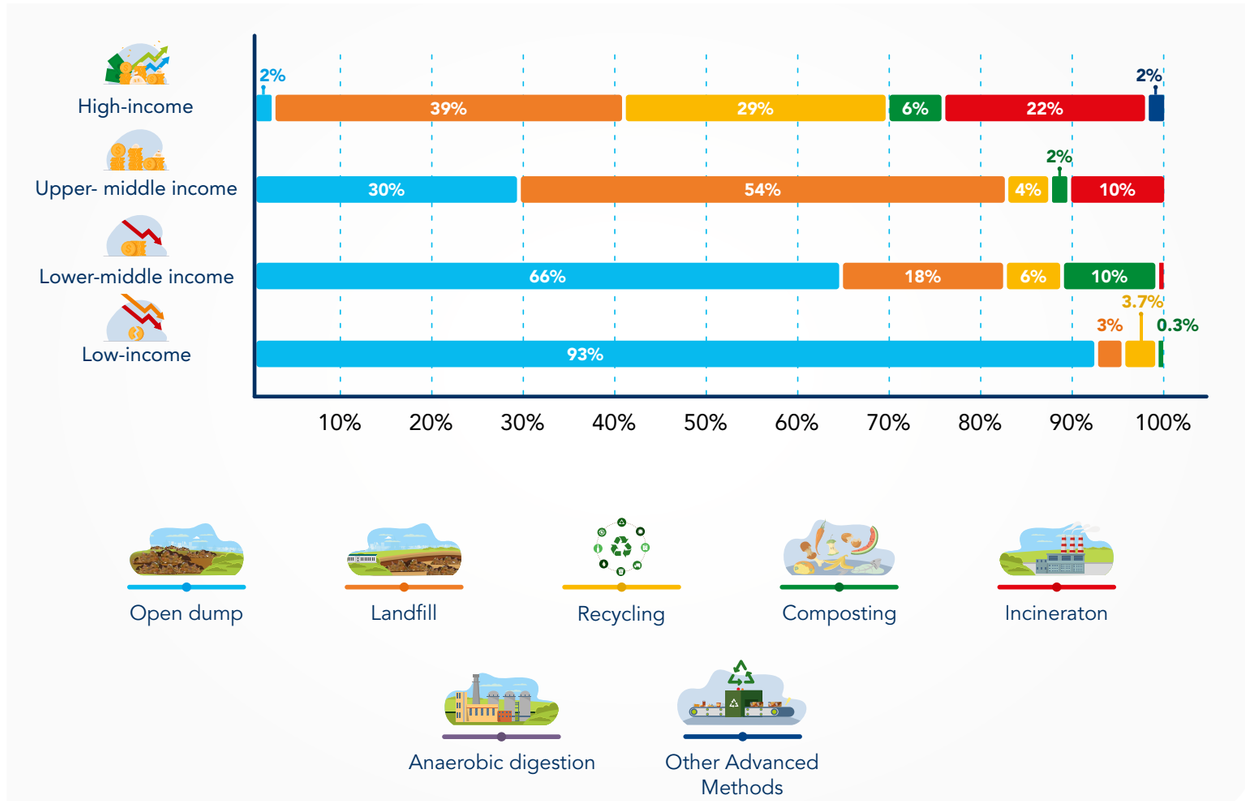
1 World Bank (2018), What a Waste 2.0, pg. 1.
2 Jeske et al. (2021), Digging Through: An Inside Look at Municipal Waste Management in Myanmar.

Impacts of unmanaged waste

Unmanaged waste has a whole slew of negative social, economic and environmental impacts. Uncollected or improperly disposed waste will leak into the environment and pollute water streams. Some of this may make its way into the oceans (Myanmar's Ayeyarwady river is one of the most polluted rivers in the world,[3] with an estimated 100 tons of garbage entering it every single day[4].), which then enters our food chains. Even if waste is collected and disposed of in landfills, it can still leak into the environment if improperly managed, and leachate – a toxic sludge which usually consists of dissolved organic matter, inorganic compounds including sulphate and chloride ions, and heavy metals such as lead – will contaminate the soil and groundwater unless collected. This leads to public health impacts, which in turn hampers economic growth. It may moreover be more expensive to retrofit SWM solutions, such as upgrading landfills.

Figure 1: Disposal method by income category

Source: World Bank (2018)



3 https://theoceancleanup.com/sources/

4 Thant Myanmar (2019), "Plastic in the Ayeyarwaddy." https://www.thantmyanmar.com/en/riversurvey

Global trends reflect this change in consumption patterns. According to findings from the World Bank's (2018) landmark "What A Waste 2.0" report, the share of organics in household waste fell from 64% to 56% in the preceding six years, as low- and middle-income populations consume more plastics, paper and metal than before. However, with rising urgency, poorer countries are also taking positive steps to tackle the problem: collection rates amongst low-income countries rose from 22% to 39%, and globally, 19% of materials are recovered through recycling and composting (although the recovery rate in low-income countries is only 4.0%).

Not surprisingly, regional trends vary immensely. According to "What A Waste 2.0", the East Asia & Pacific Region (which includes Myanmar) had an average waste generation rate of 0.56 kg per capita in 2016, far below middle- and higher-income regions like North America and Europe & Central Asia, but slightly higher than South Asia and Sub-Saharan Africa (see Table 1 below). However, according to a recent study by Jeske et al. (2021),[5] the waste generation and composition of Myanmar is more akin South Asia than the East Asia & Pacific region at 0.38kg per capita per day and still contains a high proportion of organic waste[6]

Table 1: **Comparison of regional differences in solid waste generation** (source: World Bank 2018).

Region	Waste Gen.	Collection Rate	% Organics	% Open Dumping
East Asia & Pacific	0.56 kg/capita/day	71%	53%	18%
Europe & Central Asia	1.18 kg/capita/day	90%	36%	20.1%
Latin America & the Caribbean	0.99 kg/capita/day	84%	52%	26.8%
Middle East & North Africa	0.81 kg/capita/day	100%[7]	58%	53%
North America	2.21 kg/capita/day	100%[4]	28%	0.4%
South Asia	0.52 kg/capita/day	44%	57%	75%
Sub-Saharan Africa	0.45 kg/capita/day	44%	40%	69%

Myanmar's national waste management governance is weak. Although there is a patchwork of relevant environmental legislation, including the National Environmental Conservation Law (NECL) of 2012, there is a near-total lack of monitoring and enforcement mechanisms. At the Union level, environmental issues – including solid waste – are overseen by the Ministry of Natural Resources and Environmental Conservation (MONREC), where safe management of solid waste falls under the Environmental Control Division (ECD).[8]

An important milestone was the recent development of the National Waste Management Strategy and Action Plan (NSWMSAP), which sets ambitious targets for improving the collection, treatment and disposal of waste from between 2018 and 2030.[9] The ECD has reportedly committed to hire up to 20,000 environmental officers over the next five years to monitor environmental pollution across the country, but their exact role and responsibilities – including potential oversight of solid waste management – remain unclear.

5 Disclaimer: the authors of this report were co-authors of the Jeske et al. (2021) paper.

6 Aggregate data shows that urban waste in Myanmar is 53% organic. There is a lack of data for rural Myanmar, although it is certain that the national average would have a significantly higher proportion of organic material.

7 Rounded up.

8 The department's Pollution Control Division (PCD) is tasked with development waste management policies and legislation.

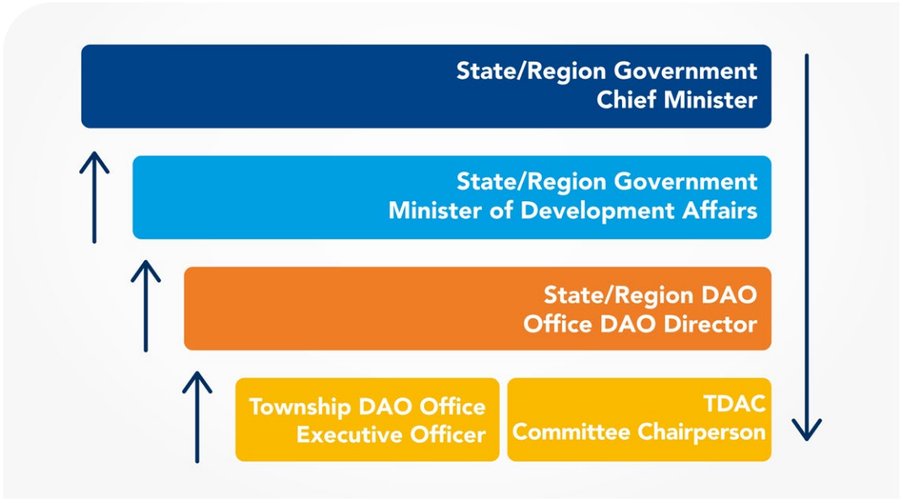
9 The PCD is reportedly also planning to develop a plastic and hazardous waste management guideline.

1.2 Regional Context: Ayeyarwaddy Region

Ayeyarwady Region is the second-most populous of the of 14 States and Regions in Myanmar, which each have partially devolved governments with a centrally appointed Chief Minister. In line with the recommendations of the National Waste Management Strategy and Action Plan (NWMSAP), Ayeyarwady Region government became one of the first States/Regions to develop its own Waste Management Plan, which was published in May 2020. Although they have a Development Affairs Minister and a supervisory DAO (Development Affairs Organizations) office, the Regional government is largely hands-off and responsibility for waste management falls squarely on township DAOs.[10]

Township DAOs consist of two entities, namely the Township DAO Office (TDAO), which focus on everyday urban governance, and the Township Development Affairs Committee (TDAC), which has decision-making power and oversight of the DAO office. TDAOs are in charge of collecting and disposing of solid waste – including household, industrial and specialist (hospital) waste – and collecting relevant waste collection fees and taxes. DAOs are the only local government body in Myanmar that is fully decentralised: they largely raise their own funds, and the majority of TDAC members are elected representatives from the local community (Arnold et al. 2015). Unfortunately, municipal SWM is a costly affair and TDAOs are chronically underfunded (see Section 2.4 below), even more so in Ayeyarwady which is one of the poorest regions in the country. SWM financing structures in Myanmar are inconsistent, and most townships – including Pathein – do not have official waste collection fees. This usually leaves TDAOs (including Pathein) struggling to provide adequate waste collection coverage, and open dumping is widespread.

Figure 2: Organisational diagram of local municipal government reporting structures in Myanmar.
Source: Arnold et al. (2015: 5)[11]



10 *Si-bin tha-ya-ye apwe* in the Myanmar language

11 Arnold, M. et al. (2015). "Municipal Governance in Myanmar." The Asia Foundation Policy Brief Series.

The Unique Role of Ward Administrators

The lowest level of local government in Myanmar are Urban Ward and rural Village Tract administrators. Previously appointed by the General Administration Department (GAD), ward administrators are the main point of contact with formal government for most urban residents. These administrators typically mediate civil issues but also assist other local government institutions with executing their duties, including tax collection and voter registration. Recent reforms made the semi-voluntary ward administrator role (which receives a small stipend) to be elected by local household representatives, and they are expected to work part-time with the assistance of one or two office clerks. Because of their proximity to the local community, ward administrators are a vital link which can make or break development interventions.

However, because they fall under the GAD which is overseen by the Union GAD office in NayPyiTaw[12], the DAO does not have direct authority over ward administrators. The strength and efficacy of the working relationship between TDAOs and ward administrators varies widely across the country and usually comes down to personal relationships, especially between TDAO and township GAD officials. Underneath ward administrators, there are voluntary heads-of-ten-households and heads-of-hundred-households, who are selected by the community and assist with information dissemination and occasionally with fee collection.

12 Until recently, the ubiquitous GAD (which exists at all level of government) was under the Ministry of Home Affairs and therefore not under civilian authority. The GAD was historically an instrument of civil administration and control for consecutive military regimes (see Saw and Arnold 2014, "Administering the State in Myanmar: An Overview of the General Administration Department"), although a gradual reform process began in 2018.

Ayeyarwady Region is largely rural and famed for being the rice bowl of Myanmar, although productivity has been slow to benefit from mechanisation and improved seeds. It is also relatively poor, scoring slightly below the Union average in key socioeconomic indicators such as consumption level, multidimensional poverty index (MPI) score, and primary school completion. However, it has a slightly higher d10/d1 ratio than the Union average which indicates a lower level of wealth inequality, perhaps reflecting the Region's relatively low level of urbanisation of just 15.8%. The table below summarises key socioeconomic indicators.

Table 2: Main socioeconomic indicators for Ayeyarwady Region compared to Union (national) level.

Indicator	Ayeyarwady Region	Union
Population	6,339,986 (12.6%)	50,178,703 (100%)
Urban population	1,003,753 (15.8%)	13,308,291* (28.3%)
GDP per capita[13]	MMK 1,681,707 (2019-2020)	MMK 1,901,787 (2019-2020)
Daily Consumption	MMK 2,344 (2017)	MMK 2,6,28 (2017)
Poverty Headcount %[14]	31.7% (2017)	24.8% (2017)
MPI score	0.237 (2020)	0.176 (2020)
d10/d1 Ratio	5.7 (2017)	6.5 (2017)
Primary School Completion[15]	61.8% (2017)	63.6 (2017)
Access to Improved Toilets[16]	87.9% (2017)	89.0% (2017)

* Excludes unspecified populations (proportion calculated as % of 47,102,966).

13 GDP constant in MMK using 2015-16 as baseline year (source: 2019-2020 national budget/2014 census/own calculations). In 2019 to 2020, the exchange rate averaged around US$ 1 = MMK 1500.

14 Based on the national poverty line in 2017 of MMK 1,590 per adult equivalent (source: MLCS 2017).

15 % of adults over 15 that have completed primary school or more, excluding those with some primary schooling and monastic education (source: MLCS 2017).

16 Access to toilet facilities with some form of flushing mechanism or cover, excluding open pit latrines, hanging toilets, and open defecation (source: MLCS 2017).

1.3 Local Context: Pathein City

Pathein is the capital and largest city of Ayeyarwady Region with an urban population of 187,442, amongst 40,935 households, according to the 2014 census.[17] Pathein is located on the bank of the Pathein branch of Ayeyarwady River. Although the regional SWM Plan commits the Ayeyarwady Region government to supporting the work of TDAOs and upgrading their capacity, this has chiefly come as in-kind support with the donation of trucks for waste collection.[18] Pathein has 15 urban wards of which 13 receive some form of formal waste collection service. Although Pathein TDAO has taken steps to increase waste collection rates in recent years, 45% of respondents in a DEALS baseline survey (2019) reported "poor" or "very poor" satisfaction with waste collection services in their city.[19]

Figure 3: **Roadside waste collection with a three-wheeled mini truck in Pathein, with old, discarded plastic bags in the foreground.**

The key issues facing Pathein are congruent with both national and global SWM trends for developing countries. These include:

- Lack of data with which to accurately plan policy interventions
- Low capacity for data collection, policy planning and project implementation
- Strained municipal budgets
- Low human resources
- Incalcitrant cultural practices
- Solutions unfit for local context
- Lack of inclusion.

The need for pro-poor planning

The urban poor are typically those hit the hardest by the impacts of bad solid waste management. This is because (i) they are often the last to receive service, whether due to institutional bias or low spending power; (ii) the urban poor are less capable of shouldering the health impacts of poor waste collection, and (iii) they are the hardest hit by many remedial policies such as waste collection fees or plastic taxes. Urban governance reform should therefore be pro-poor by taking into account the potential impacts of policy initiatives on the lowest income earners already in the planning stage. Policy makers can for example conduct surveys of plastic usage amongst slum dwellers, conduct livelihood assessments of informal waste pickers, or consider progressive fee structures or subsidies for poor households to offset the cost of new programs.

17 Pathein Township has a further rural population of 193,543, although these are organised into Village Tracts (as opposed to Urban Wards) and are not provided any services by the TDAO. Waste management issues in Village Tracts fall under the purview of the Department of Rural Development (DRD) under the Ministry of Agriculture, Livestock and Irrigation (MOALI) although they do not provide any collection services.

18 The Ayeyarwady Regional Township Development Affairs Office (RTDAO) has also encouraged TDAOs to develop their own waste management plan.

19 With 78 respondents, the baseline survey is not statistically significant although it provides a useful statistical anchor point.

2 SWM Governance Structure in Pathein

2.1 Formal Waste Management Structures

The TDAO is responsible for all urban solid waste management in Pathein, chiefly, the collection and transportation of garbage to the municipal land-fill. This includes household waste, business waste, industrial waste, specialised (hospital) waste, and waste from wet markets and public bins. The city employs a fleet of 9 trucks, 13 thawlar-gyi (three-wheelers), four hook lift trucks, which each empty twenty 22m3 waste storage bins throughout the city each day (see Annex 3), and has a network of ten 660-liter public waste bins. In total, the TDAO employs 147 employees of which 47 work in the Cleaning Department.

Limitations of civil administration hiring regulations

Civil service regulations set at the Union level can sometimes hamper capacity building in DAOs. There is a rule that caps the proportion of income spent on payroll expenses at 1/3 of total income, which means that virtually all DAOs have a high proportion of unfilled positions. In Pathein, for example, the TDAO has only filled 147 out of 440 extant positions. One common workaround – especially in municipal cleaning department – is to hire day labourers, who are paid the minimum wage of MMK 4,800/day, although this may lead to a lack of skill specialization and poor staff retention. Although all DAOs are resource constrained, the Union regulation stops them from expending their budget in the most expedient way possible, such as for example hiring more tax collectors to increase revenues. The State/Region parliament has the authority to potentially lift this rule by passing a new RDAO law, although this was not included in the draft municipal law which was proposed in 2020.

Collection frequency and coverage varies widely across the city but is more consistent in central area. This is due to a variety of factors including convenience, accessibility (newer neighbourhoods such as ward 12 consists mostly of dirt roads), insufficient equipment, and potentially also due to an institutional bias towards poorer population segments. According to data from Pathein TDAO, the municipal administration provides direct collection services – varying from once a week to thrice a week – to 168 streets[20] out of a total of 540 streets across the city's 15 wards. A further 105 streets in five wards are serviced by ward-based "Ward Welfare Groups" using thawlar-gyi three-wheelers supplied by the TDAO while 17 streets have communal waste cans that are emptied by the TDAO. It is noteworthy that 24 streets receive daily servicing and 45 and 72 streets receive thrice- and twice-weekly collection, respectively. The remaining 27 streets only receive weekly servicing.

Experiments with ward-based waste collection solutions

Like some other towns in Myanmar, including Monywa and Hpa-An, Pathein has experimented with ward-based collection systems. This can either be by the local ward administrator or the community itself. In Pathein, four wards were provided with small *thawlar-gyi* three-wheelers by the TDAO, which were independently managed by so-called "Ward Welfare & Support Groups" who also collect fees. The experiment was considered successful in Ward 3, a relatively wealthier neighbourhood where the waste collection fee was fixed at MMK 1,000 per household per month for bi-weekly collection, which was sufficient to meet the cost of labour, fuel and repairs. In Wards 1, 5 and 9, the same initiative generally failed, chiefly because household collection fees were too low for the system to be sustainable, reportedly as little as MMK 200 per month.[21] When some wards tried to increase the collection fee, it was met with resistance by the local community and Wards 1, 5 and 9 have struggled to sustain their collection services.

Ward-based collection services have several potential advantages:

- It is often easier to collect fees from households because the ward administrators and heads-of-households know the community members personally (which avoids free-riding).
- Operational costs can be kept low.
- The ward can focus on primary collection and thus expand coverage and/or frequency.

However, there are also several potential disadvantages:

- Poor households may not be able to afford a sustainable collection fee.
- It puts extra administrative burdens on ward administrators, who may be unable or unwilling to take on the extra responsibility of managing the system.
- Without secondary collection provided by the municipality, the system is inefficient to scale up.

Development interventions like DEALS should therefore carefully consider whether it is advantageous to support devolved waste collection in target neighbourhoods.

20 Some wards only receive service in one or a handful of streets.

21 Ward 7 was reportedly also given a three-wheeler, which had broken down and – by the time of writing – not yet been repaired.

The city's sole active landfill is 8.021 acres large and lies within the urban boundary, 2.55km from the city centre. It was opened 50 years ago and is already considered full; the municipality is trying to extend its lifespan by shovelling waste to the side, although they only have one digger there. The landfill is effectively unmanaged since there are no waste handling facilities such as leachate collection, weighbridges, or trenches with soil sealing. The landfill is only fenced off on one side, with waste and leachate clearly leaking into the surrounding areas. As Figure 2 shows, the landfill is barely 1km away from the bank of Pathein river. The TDAO is currently planning to open up a new landfill, approximately 20km north of the city, which they recently acquired the land for. However, it is uncertain when and how they will secure funding for developing it.

Figure 4: **Aerial photo of Pathein waste disposal site.** Source: Dr. Ali Abedini (2020).

Figure 5: **Thawlar-gyi, a common primary waste collection vehicle in Myanmar.** Source: Møller (2020).

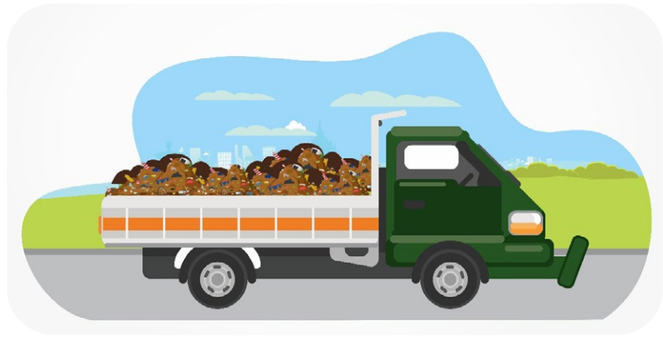


Figure 6: **Plastic shredder at local plastic recycling plant in Pathein.** Source: VNG International.

2.2 Informal Waste Management Structures

Informal waste management in Pathein primary revolves around recycling, although there are also informal waste collectors serving businesses and construction sites ad-hoc. Recycling is operated by a network of 17 "junk shops" spread throughout the city, which all have a business license issued by the TDAO. These junk shops collect recyclable materials from informal waste pickers based in the city as well as villages from around Ayeyarwady region. The junk shops essentially act as low-level aggregators, which then send it to wholesalers in Yangon (some junk shops clean and shred materials before sending them off) or to a small local recycling plant in Pathein which makes plastic pellets. It is estimated that roughly 1,000 tons of recyclables are sent off to Yangon each month.[22]

22 VNG (2019, pg. 6). "Pathein City Waste Audit and Recommendations for Waste Improvement."

2.3 Key Stakeholders

Although waste management has formally been decentralised to DAOs, there are numerous stakeholders that have both relevance and influence. Moreover, because Pathein is the seat of the regional government, the Pathein TDAO is in close proximity to other key institutions, including the Ayeyarwady cabinet, regional MPs and the RDAO. The most important bureaucratic official at the Region level is the Director of the RDAO office, U Phone Lwin, who reports to the Region Minister of Municipal Affairs, U Kyaw Myint. All stakeholders have been summarised in the DEALS Pathein Inception report (VNG 2018)[23] and reproduced in Annex 1 below.

Key observations:

- The most active local Civil Society Organisation (CSO) is Clean Pathein, which has collaborated with VNG International and Thant Myanmar on awareness campaigns.
- Each ward in Pathein has a so-called "Ward Cleaning and Support Group," a 15-member committee made up of local community members and ward administrative staff charged with an increasing level of involvement in waste management oversight and awareness raising. However, the committees have no formal responsibilities and primarily report instances of littering to the TDAO (which the TDAO is under no obligation to follow up on), and do not appear to have made any significant impact in the city as a whole (although it formed an important stakeholder for the DEALS interventions in Ward 12; see section 5).
- The ward-based collection systems in Wards 1, 3, 5 and 9 (described in Text box 5) have not been formalised in the sense that they are not under any official municipal contract. Instead, they are managed directly by the ward administrators (effectively as a form of informal outsourcing).
- Regional MPs in Myanmar do not have significant amounts of power, but are becoming increasingly influential, especially if they are well-connected "local VIPs." Waste management development efforts should actively engage MPs to gain political support and increase the likelihood of getting (financial) support from the Regional Government.
- There are three further stakeholders who have expressed concern about marine plastics emissions and can be classified as interested parties. These could be engaged in collaborating on or subsidising waste management efforts:
  - The Department of Fisheries (DoF) under the Ministry of Agriculture, Livestock and Irrigation (MOALI), which is headquartered in NayPyiTaw and has a regional office in Pathein.
  - Myanmar Hotelier Association (which has a regional chapter centred around the local tourist destinations of Chaung Thar and Ngwe Saung beaches).
  - The World Bank's Myanmar Coastal and Delta Resilience Program, which includes a planned SWM project aimed at reducing marine plastic emissions from the Ayeyarwady Delta (most likely through funding one or two landfill upgrades and creating a waste reduction program).

23 VNG (2018). "Governance of Inclusive Green Growth for Squatter Settlements and Neighbourhoods in Pathein Township."

2.4 SWM Financing

Pathein TDAOs cleaning department has three revenue streams, chiefly the cleaning component (line item) of the municipal property tax (as well as minor income from littering fines and from ad-hoc waste collection fees paid by businesses, hospitals etc.). However, departmental revenue covers only a fraction of its expenses, as summarized in the financial statement below, and the Pathein TDAO cleaning department has a chronic operational deficit of 85-97%. The annual deficit ("losses") is effectively cross-subsidized by the DAO's general budget.

Table 3: Annual operational accounts of TDAO cleaning department.

	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-2020
1.Expenditure	273,835,000	451,432,000	345,886,000	397,301,000
2. Revenue	36,748,982	41,815,420	52,577,451	23,318,429
2.1. Tax	29,731,982	32,267,920	37,578,451	15,234,429
2.2. Service fee	7,017,000	9,547,500	14,999,000	8,084,000
Surplus/(Deficit)	(237,086,018)	(409,616,580)	(293,308,549)	(373,982,571)
Revenue as % of expenditure	13%	9%	15%	6%

DAOs in Myanmar are almost entirely financially self-reliant, with only limited funding from the Region government (both cash and in-kind, such as the donation of waste collection trucks). Their primary sources of revenues are monopoly license auctions (chiefly slaughterhouses), business permits, property taxes, and a 5% share of the income tax that is collected by the Internal Revenue Department (IRD) and dispersed from NayPyiTaw. The property tax system in Myanmar is widely considered outdated; building owners (if they can be identified) pay property tax every six months, usually only a small amount numbering a few hundred or few thousand MMK because property values are chronically under-estimated (see Annex 2). The exact composition and itemized rates of the property tax varies between townships, but it generally includes three or four line items including a cleaning/sanitation tax fee which therefore represents the "revenue" that cleaning departments receive. In Pathein TDAO, the "garbage and sanitation tax" represents about 35% of property tax income which – in FY 2018-19 – represented just 15% of municipal revenues.[24]

2.5 Potential Conflicts of Interest

The only currently active conflict of interest is between the municipality and informal waste pickers. It has been reported that Pathein TDAO are "unhappy" with waste pickers because they supposedly litter while going through waste bins. This fits a general pattern of informal waste pickers being denigrated (and occasionally fined) in spite of the valuable service they provide. There is a potential of a stronger conflict of interest that would threaten their livelihoods if Pathein TDAO in future decides to formalise the recycling value stream (or otherwise side-line informal waste pickers).

Anecdotal evidence also suggests that there is a bias in favour of wealthier citizens by the municipality, given that wealthier wards generally have better and more waste collection coverage. This is problematic because it treats residents more akin to consumers and not as equal citizens.

Any interventions at the ward-level should involve close coordination with the township GAD. Any larger interventions which would involve systematic reorganisation of the municipal waste collection system as a whole, including the roles and responsibilities of the ward administrative staff, have a risk of creating a conflict of interest between the TDAO and township GAD office if not negotiated in advance.

24 DRI (2020). "Scoping Report: Integration of Waste Management in Planning and Budgeting (Pathein Municipality, Ayeyarwady Region)."

3 Pathein Waste Situation Indicators

3.1 Technical Waste Indicators

Technical data are important for implementing and managing waste systems although they tend to be scarce in developing countries like Myanmar. Accurate data are required to conduct accurate situational assessments, design appropriate policy measures, and conduct continuous monitoring and evaluation of projects. The most important (and commonly assessed) indicators are:

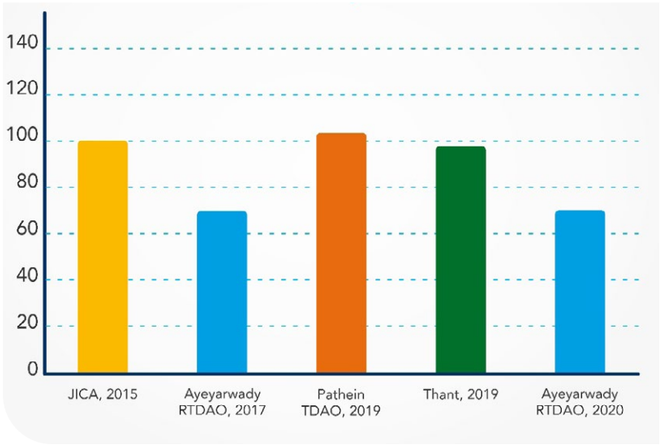
- Waste generation rate
- Waste composition
- Waste collection coverage
- Wastes disposal method(s)

In Myanmar such data are usually not reliable at local, regional, nor national level, which makes it difficult to implement adequate waste management policies. Common issues include lack of detail on data collection methodology, unknown sources, and inconsistent results for the same cities or areas. Pathein is no exception, hence the technical data analysis provided below should be taken as indicative and – where relevant – shows multiple sources.

3.1.1 Waste generation and composition

Figure 7 shows the different data available for waste generation rates in Pathein. Waste generation data varies widely between the different sources, by a factor of up to 2 (i.e. from 68t/day to 124t/day). The description of the methodology used for data collection is absent in all the reports except in the 2019 study conducted by Thant Myanmar, which makes it difficult to interpret and compare the data.

Figure 7: Waste generation in Pathein according to various sources (Ton/day)



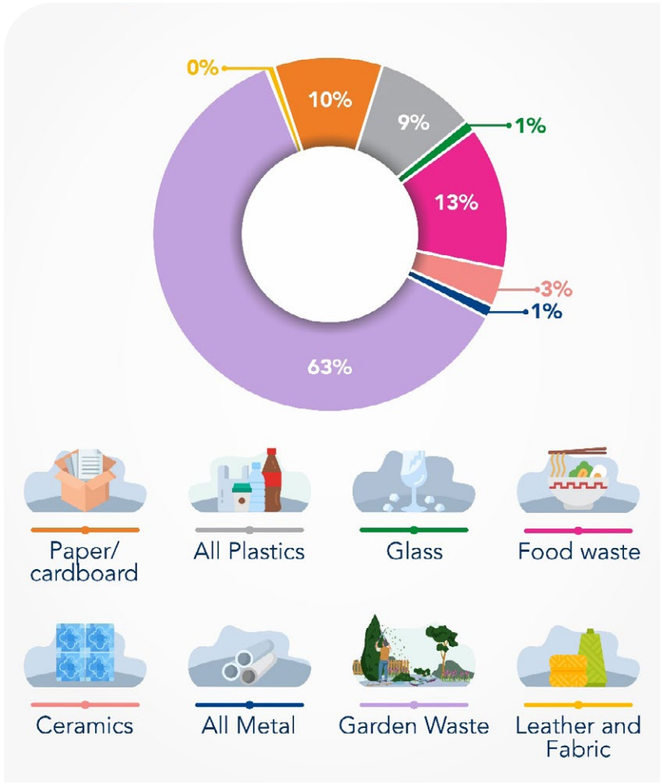
An average waste generation rate for Pathein based on these figures is 92 tons/day, similar to the estimate of Thant Myanmar and JICA. It represents a generation rate of 0.49 kg/capita/day[25]. Nevertheless, this figure should be used with caution given that the waste audit methodology is unknown for all sources except one. It is likely that waste generation per capita is higher, and the figure assessed may only represent the waste stream that is collected by the municipality. Considering the national average estimation for waste leakage (30%) and the informal recycling rate (20% of total waste),[26] the authors of this paper estimate that the actual waste production for Pathein city is 0.66 kg/capita/day.

25 This is based on the urban population of Pathein according to the 2014 census, which is the most accurate figure available.

26 Jeske et al. (2021), Digging Through: An Inside Look at Municipal Waste Management in Myanmar.

VNG International assigned Thant Myanmar (2019) to conduct the only existing waste composition survey in Pathein, whose results are summarized in Figure 8.

Figure 8: Waste Composition in Pathein (Thant Myanmar 2019)



The waste composition is similar to other cities in Myanmar, with a very high prevalence of organic material followed by dry recyclables. The waste composition shows a high potential for organic waste treatment and recycling. As mentioned above, this survey gives valuable insight although important seasonal variations can occur, which could not be detected with the methodology used by the half-day audit conducted with Thant Myanmar.

3.1.2 Waste collection coverage

There is no standardized definition for waste collection coverage. As pointed out in the "What a Waste 2.0" report,[27] waste collection coverage data are reported according to multiple different indicators around the world. Based on extant data, waste collection coverage in Pathein can be assessed in four different ways, each of which is described with their respective shortfalls in the table below.

Table 4: Summary of leading waste coverage indicators

Indicator	Explanation	Shortfalls	Data Limitation in Pathein
$\frac{\text{Total waste collected}}{\text{Total Waste produced}}$	Most common and most objective definition.	It doesn't provide any indication on spatial coverage.	Difficult to quantify the amount of waste collected through the different channels.
$\frac{\text{Collected streets by municipality}}{\text{Total Number of streets}}$	Indicates the geographical extension of the waste collection service.	Some stakeholders participate in waste collection as CSOs or in the informal waste industry. The indicator does not take these actors into account.	Data standardization practices can have an important impact on the final value of indicators, such as the official definition of a street or the actual length of the streets as recorded by the municipality. Those points are not clarified in the sources available.
$\frac{\text{Collected Wards by Municipality}}{\text{Total Number of wards}}$	Indicates the geographical extension of the waste collection service.	Some stakeholders participate in waste collection as CSOs or in the informal waste industry. The indicator does not take these actors into account.	Some wards are only partially covered by the municipality and so the indicator is biased depending on the definition of what is called a "collected ward". The indicator can vary from 31% if only wards totally covered are taken into account. It can reach 80% if wards partially covered are taken into account.
$\frac{\text{Collected Households}}{\text{Total Number of Households}}$	Proxy data need to be used. Pathein Baseline Report, DEALS, 2019 estimated through a house-to-house survey the number of people satisfied with the waste collection service. If it is assumed that people considering the service quality as moderate, good and very good benefit currently from the service, the waste collection coverage is 55%.	It does not provide any indication on spatial coverage.	No direct data to calculate this indicator.

27 Source: Kaza et.al. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050

The waste collection coverage for Pathein varies a lot based on the indicator that is used. Going by the absolute number of streets that receive service, it can be said that Pathein achieves 55% waste collection coverage. However, the varying collection frequencies (see Section 2.1) and amounts make this a poor estimate. Pathein TDAO does not have any estimates of its waste collection quantity, but reports by the RTDAO estimate coverage in 2020 to be at 60% based on their own figures of 42 tons collected and 69.51 tons generated per day (although it is uncertain how these figures were derived). In terms of the number of wards that fully rely on municipal collection service, only 1/3 (five wards) of Pathein is covered. For comparative purposes, we use the average figure of 51% as the benchmark for formal collection coverage in Pathein City.

However, these indicators underestimate the actual coverage as only formal waste collection services provided by the municipality or ward are taken into account. The actual collection rate is likely higher as the informal sector collects a significant part of the recyclable waste. It is estimated that in Myanmar secondary cities, 75% to 85% of waste is collected of which 10-12% is by the informal sector.[28]

A geographical approach of this indicator gives a better overview of the situation in Pathein and an explanation of the variability of the indicator. The maps below represent the waste collection service in Pathein in 2020.

Figure 9: Waste collection coverage indicators in Pathein

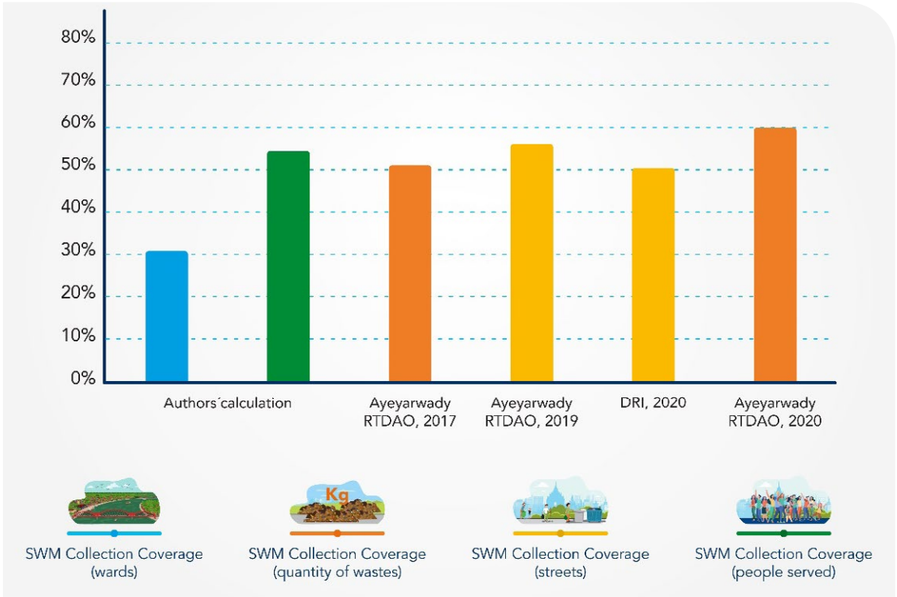
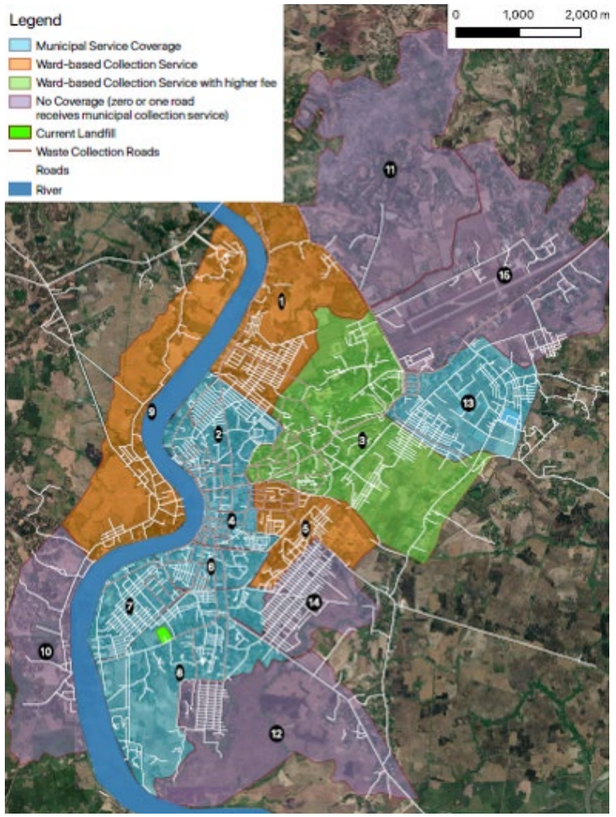


Figure 10: Waste collection coverage by predominant collection system, including municipal collection routes



28 Jeske et al. (2021), Digging Through: An Inside Look at Municipal Waste Management in Myanmar.

The municipal collection service is mostly focused on the central wards, which are more densely populated and have frequent and street-by-street service provision. This contrasts with the more peri-urban wards that have partial and less frequent collection service, with municipal trucks usually only passing by the main streets. Ward-based initiatives (as described in Text box 3) have helped expand coverage but have until now only reached full potential in Ward 3 which charges a higher service fee from households. This means that significant amounts of household waste are either leaking into the city's rivers and streams, or are being burnt by households.

3.1.3 Waste Disposal

Waste produced in Pathein is either disposed in a landfill, recycled or leaks into the environment. There are no accurate data about the different waste disposal streams. Assuming that all waste collected by Pathein TDAO ends up in the municipal landfill, the landfill disposal rate is between 51% and 60%. In Myanmar's secondary cities, the recycling rate is between 10-12%.[29] Waste leakage in Pathein can therefore be estimated at between 30% and 40% of the total waste generated.

3.2 Comparison with national averages and similar cities

This section provides a comparative analysis of the waste situation in Pathein using key indicators. They are benchmarked against Myanmar national averages, similar cities in Myanmar and the region, which provides valuable insight into Pathein's relative waste situation (which can help improve municipal waste management planning).

3.2.1 Waste Generation Rate

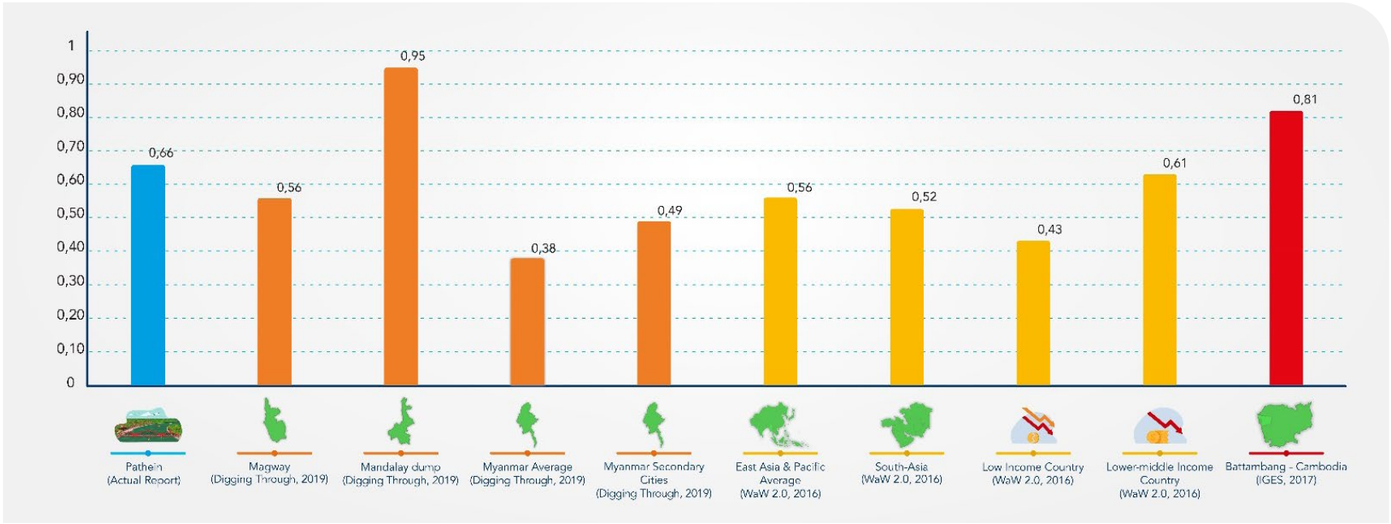
Waste generation in Pathein is within typical range of a secondary city in Myanmar, whose national average is 0.49 kg/capita/day. Nevertheless, the Pathein value of 0.66kg/capita/day (estimated) is above the average for a secondary city, commensurate with how waste generation grows with urban and economic development. However, it is still significantly below the rate of primary cities such as Mandalay (second-largest city in Myanmar with 1.2 million inhabitants), where waste generation is above 0.9 kg/capita/day.

Regional data from the "What a waste 2.0" report may also offer points of comparison for benchmarking purposes. Pathein's waste generation rate is higher than the regional average for both East Asia & Pacific and South Asia. However, those regional averages represent a combination of both urban and rural waste generation rates, and so their urban averages are actually higher. It is uncertain how urban Pathein compares to urban regional rates although it is likely to be slightly lower.

When comparing with similar cities in the region, the main challenge is the lack of reliable data in the Southeast Asian region. Waste data are scarce. Battambang in Cambodia, for example, has the same number of inhabitants as Pathein but the waste generation is much higher in Battambang (0.80 kg/capita/day). The higher economic development of Cambodia can explain this difference. The actual waste situation in Battambang is even higher than the projected waste situation in Pathein for 2030 (See Text Box 6).

29 Jeske et al. (2021), Digging Through: An Inside Look at Municipal Waste Management in Myanmar.

Figure 11: Comparison of waste generation in Pathein with national and regional references

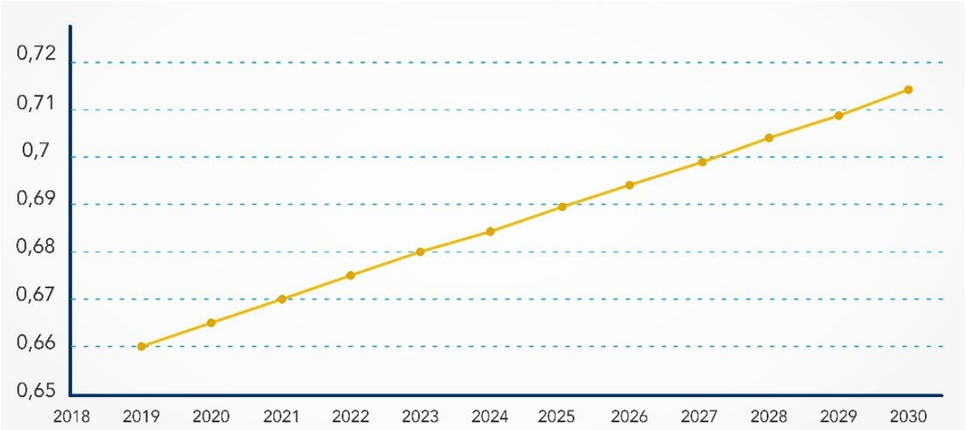


Estimating waste generation growth in Pathein

Waste generation increases with economic development. As mentioned above, estimating waste generation is key for designing SWM interventions. It is also important to have data on dynamic changes over time to develop adequate long-term solutions. "What a waste 2.0" created a model to predict the waste generation evolution in a given area, using waste generation per capita together with the GDP per capita PPP[30] as a proxy for consumption rate growth (and modified with local waste generation information). Assuming a waste generation rate of 0.66 kg/capita/day in 2019, and estimating a total GDP per capita growth of 30% from 2015 to 2030 using a linear regression, waste generation in Pathein will reach 0.71 kg/capita/day in 2030 in Pathein city. Together with an expected growth in urban population, the city faces a considerable increase in overall waste generation.

30 Purchasing power parity, a measure of the absolute purchasing power of people's incomes.

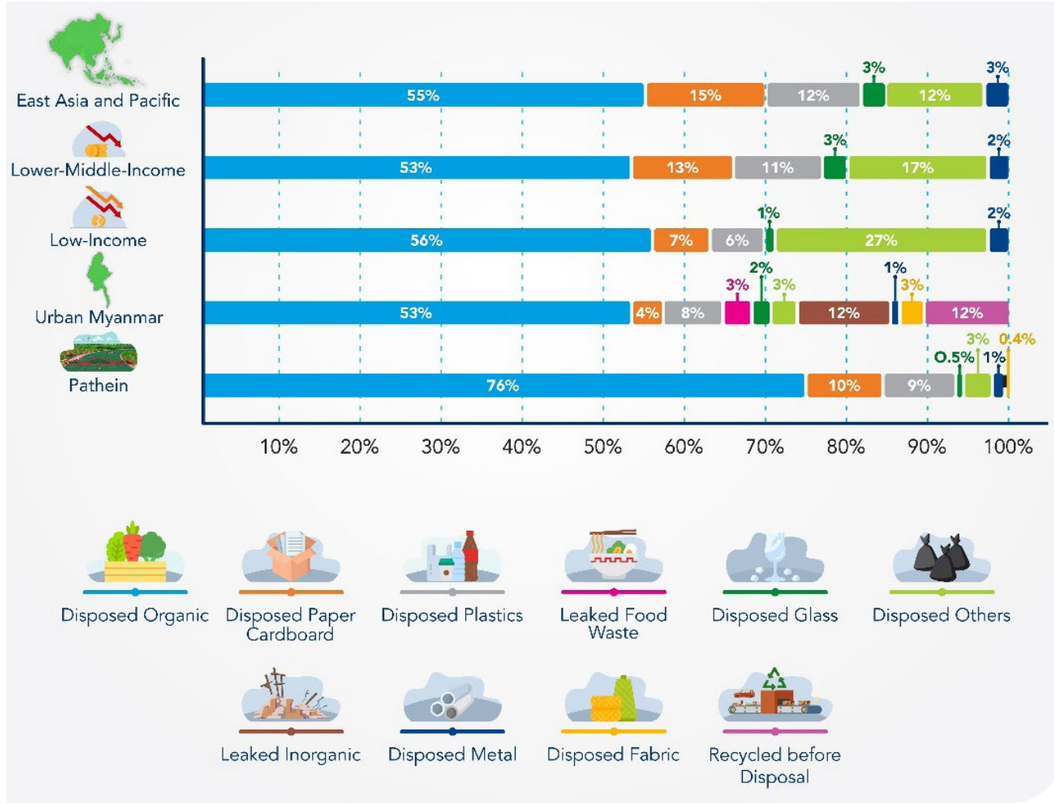
Figure 12: Waste evolution projection for Pathein city - Waste generation (kg/cap/day)



3.2.2 Waste Composition

When comparing Pathein's city waste composition to Myanmar and the sub-continental average, one should keep in mind that the waste composition audit has been carried out at the landfill and is only representative of the waste disposed there. It does not include the leakage and recycling rates as in Jeske et al. (2021). It therefore underestimates the actual rate of glass and metal waste that have already been diverted from reaching the landfill through recycling. Nevertheless, the main conclusion is that the proportion of organic waste is significantly higher in Pathein compared to other cities in Myanmar. This is likely because of the relatively low rate of urbanisation and lower socioeconomic development levels, as many households in Pathein are essentially peri-urban with different consumption patterns from those in major cities. It is also noteworthy that paper/carboard has a high presence in Pathein's waste stream compared to other cities.

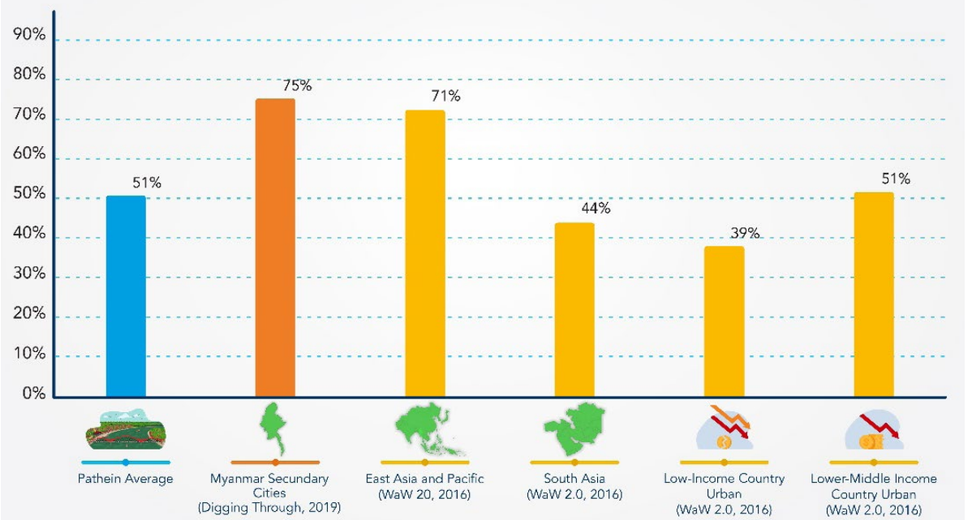
Figure 13: Comparison of Pathein's waste composition with national and multi-country averages



3.2.3 Waste Collection Coverage

To compare waste collection coverage, the most commonly-used definition focuses on absolute quantity of waste collected. For Pathein, this is assumed to be 51% in 2020. Waste collection coverage is low compared to Myanmar's other secondary cities. Although this figure does not include the significant amounts of recyclable wastes collected by the informal sector (whereas data for other secondary cities does), Pathein waste collection coverage is low compared to Myanmar's urban average. This is at least partly because of a lack of equipment. As another point of comparison, Pathein municipality has only 9 main collector trucks while Magway city (which has half the population of Pathein) has 8 collector trucks. Pathein's waste collection coverage is more akin to rural averages for other countries in the region where collection services are usually underdeveloped.

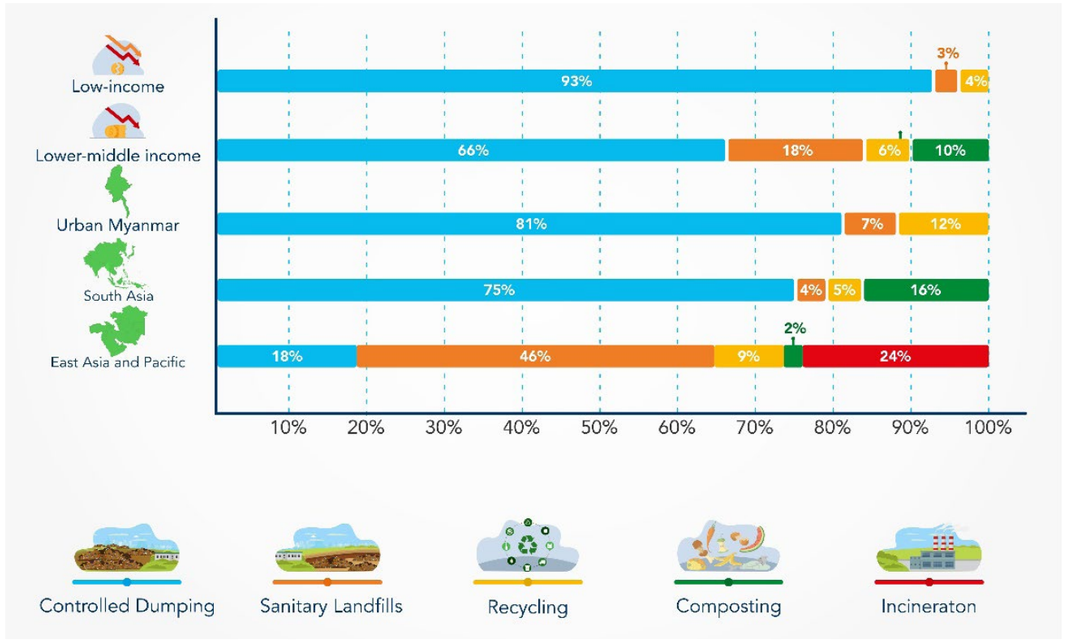
Figure 14: **Waste collection coverage comparison**



3.2.4 Waste Disposal

Waste in Pathein is either recycled or disposed in the old landfill near the city centre. Sanitary landfills are as of yet uncommon in Myanmar, and the landfill in Pathein is effectively unmanaged (except for shovelling waste to the side to make room for more). This characteristic makes Pathein close to the profile of low-income countries where waste disposal solutions are simple and not diversified. Open-air burning is also a common waste management practice in East Asia and Pacific, and is widespread amongst households in Myanmar including Pathein (which leads to significant air pollution, although no quantitative data exist). In Pathein, operating an incinerator would be a complicated and costly solution as most of the waste is organic with high moisture content which does not burn easily. In this sense, Pathein city should rather follow the common example in the South Asia subregion where composting is an important second waste treatment practice to complement improved landfill management.

Figure 15: **Comparison between waste disposal method in Myanmar with What A Waste 2.0 categories.** Source: Jeske et al. (2021)



4 Public Urban Waste Planning Initiatives

The RDAO office published a regional solid waste management action plan in May 2020. Although it contains short-, medium- and long-term targets in line with the NWMSAP for 2018-2030, it reads more like a situational analysis identifying high-level policy concerns such as operational deficits, future landfill needs and the need for water drainage infrastructure. However, the plan does not include any concrete policy proposals, Key Performance Indicators (KPIs) or detailed cost estimates. It also fails to mention plastic leakage and water pollution, in spite of this being a key environmental & health concern for the delta region, whose abundant freshwater resources are vital for rice and livestock farmers.

Although the RDAO plan identifies different solid waste fractions, such as household and industrial waste, it does not include concrete plans for how to achieve high-level goals such as "upgrading to an environmentally-friendly waste management system for hazardous wastes and industrial wastes" (Goal 2 out of 6). Moreover, it does not mention household waste composition or identify separate waste streams such as kitchen waste. This can lead to myopic policy planning since Pathein's waste contains a large proportion of organic material, which is (a) unsuitable for incineration, and (b) likely to be the area of intervention with the biggest return-on-investment. If kitchen waste can be diverted for composting, it will drastically ease the practical & financial burden on TDAOs like Pathein because it reduces the amount of waste to be collected and disposed in municipal landfills.

Overall, there is a significant lack of data to inform accurate policy design and technical solutions, whether at the regional or local level. Accurate data estimating the recycling rate in Pathein, for example, would help recognise the importance of the recycling sector and, in turn, help to design appropriate policies to regulate and encourage this industry. Furthermore, reliable data on solid waste service coverage and waste generation would allow Pathein city to design a progressive action plan to fully and regularly cover the city in partnership

with the private sector, the informal sector, community organizations, and citizens. A more detailed database (developed alongside KPIs) would act as reference points to help the RDAO monitor the development and implementation of regional and local actions plans.

There are several areas where more in-depth quantitative assessments of waste flows in Pathein can improve municipal waste planning:

- Priority waste generators, which produce toxic and hazardous waste, such as large construction projects (including upcoming industrial zones in Pathein), factories, hospitals and rice mills.
- Detailed stakeholder mapping, which can help identify solutions for waste collection. The available data seem to take into account only the municipal and related organizations collecting waste, such as "Ward Welfare & Support Groups" and ignore important individuals such as informal waste pickers and influential community members. More detailed Information is needed to identify these individual waste collection actors and the quantities they collect.
- Detailed waste disposal streams, specifically those that evade the two main waste disposal methods of landfilling and recycling. It is clear that significant amounts of waste are either illegally dumped outside of the landfill (thus leaking into the environment) or burnt. Quantifying these smaller waste disposal streams would help to identify related environmental risks and propose solutions, and could contribute to more detailed waste flow models, such as the diagram in Text box 7.
- Technical waste collection data, with key indicators such as waste density, moisture content and volume of the collection truck, would help the municipal cleaning department operate their service more efficiently and design better solutions in the future. The database and its content should be designed using international references and adapting them to the local context of Pathein city.

Waste Flow Diagram

Leeds University developed a tool that can help to provide a rapid assessment methodology for mapping the flows of macro waste in a municipal solid waste management system at the city or municipality level, including quantifying the sources and fate of any plastic pollution[31]. This tool is a 1st step for a municipality to reach the targets of SDGs related to waste management.
The authors used this tool to model the waste flows in Pathein city using the data available (and described above) and proxy data when data were not available.

31 GIZ, University of Leeds, Eawag-Sandec, Wasteaware (2020). User Manual: Waste Flow Diagram (WFD): A rapid assessment tool for mapping waste flows and quantifying plastic leakage. Version 1.0. February 2020. Principal Investigator: Velis C.A. Research team: Cottom J., Zabaleta I., Zurbruegg C., Stretz J. and Blume S. Eschborn, Germany. Obtained from: http://plasticpollution.leeds.ac.uk

Figure 16: Waste flow diagram for Pathein City (Ton/year)

This tool is a good reference to understand the importance of data collection and the information that can be derived from it. Nevertheless, current data limitation in Pathein leads to a high margin error in the estimation of the different waste flows. Collecting accurate data will help to precise this diagram.

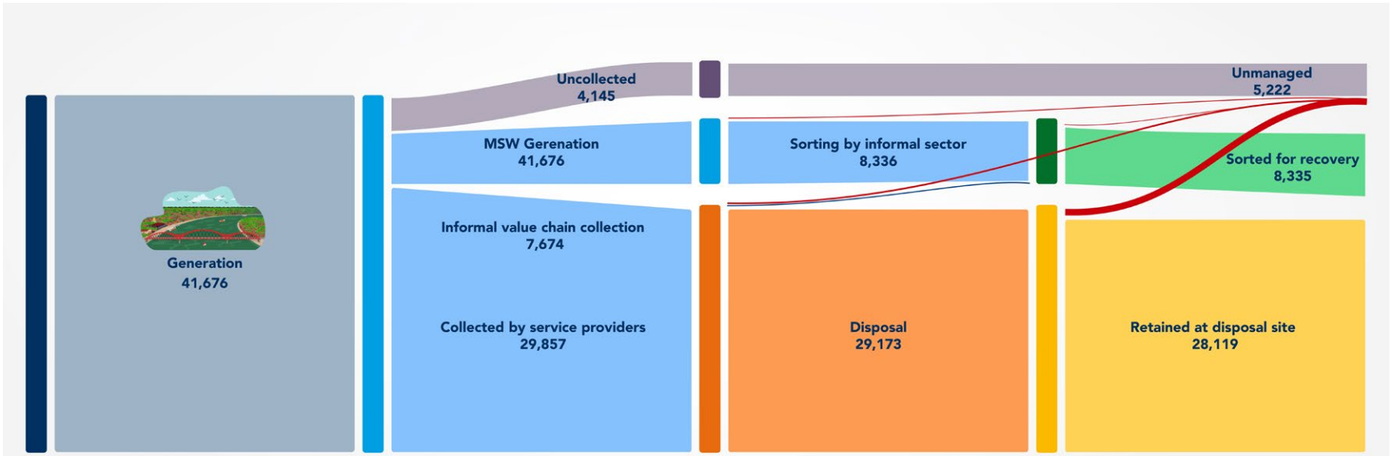


Figure 17: SDG goals related to waste management

5 DEALS SWM Interventions

5.1 DEALS Interventions in Ward 7 and 12

The Governance of Inclusive Green Growth in Cities (DEALS) programme is a five-year development project (2017-2022) that aims to support fast-growing cities such as Pathein in their transition to inclusive and sustainable development. The DEALS programme uses an integrated and inclusive approach to address urgent local priorities, whereby all activities are conducted through, by, or with local stakeholders. As pointed out by Ellen van Reesch,

> *Underlying the problem of urban waste are distributional factors. Adequate services are primarily channelled to upper- and middle-class neighbourhoods. Low-income neighbourhoods often depend on distant infrastructure for solid waste disposal, clean water and sewerage or on private service providers, while informal settlements often have no facilities at all. A comprehensive approach to sustainable urban development looks at such social and governance aspects, which typically lie far outside the mandate of waste departments. Yet, many of the challenges around waste are related to the inequitable access to land and housing, which in turn is linked to the policies, politics and power relations that determine land and housing markets.*[32]

As an integrated approach to the SWM challenges in Pathein, DEALS worked with (and through) the main governing agency, namely the TDAO, as well as other local government and non-government stakeholders. The programme launched participatory stakeholder workshops in late 2018, where the self-identified priorities for Pathein were flood prevention SWM. DEALS provided seed grants for local stakeholders to create development inter-

32 Reesch, E. (2019). Background paper on Integrated Governance Approach in City DEALS

ventions that addressed these concerns, including two focused on SWM in Ward 12: (i) improved solid waste collection by using a three-wheeler that can navigate the narrow dirt roads, and (ii) an organic waste composting network through a network of "green stations" throughout the ward. Before the outbreak of the covid-19 pandemic, a three-wheeler for collection had been purchased, ten locations for composting had been identified, and the iron frames for composting stations had been constructed.

Three interventions – which received grants of up to €5,000 – have been implemented in 2019-2020, and three more are planned. In addition to the collaboratively identified goals of improved SWM and flood prevention, the DEALS programme aims to create intangible outcomes that shore up local government capacity. The programme also provided technical inputs at the township level, including training workshops (on participatory planning) and the hiring of technical experts (Thant Myanmar and Development Resources International Ltd. provided studies on waste composition and municipal finances, respectively) in Pathein.[33] Interventions in Ward 12 appear to be building towards these long-term goals, whereas the grants in Ward 7 appear to have delivered poorer results.

Table 5: summary of SWM actions and outcomes in Pathein pilot projects

Pilot area	Grants	Tangible Outcomes	Intangible Outcomes
Ward 7	One	• Drainage lane digging	• Increased community awareness of SWM issues
Ward 12	Two	• Drainage lane digging • Road improvements • SWM collection project* • SWM composting project*	• Increased community awareness of SWM issues • Increased communication between citizens and local government • Better communication between government and non-government stakeholders • Understanding of the need for better waste management and urban planning

* On-going (paused in 2020 due to Covid-19)

5.2 Lessons

The pilot interventions saw great short-term results in Ward 12 but less so in Ward 7. As summarised in the table below, this is primarily due to high level of social capital in ward twelve and better communication between government, non-government and community stakeholders.

Issues surrounding long-term impacts and sustainability of SWM interventions, such as continued community engagement, financing of the organic composting program, and maintenance of the three-wheeler in Ward 12, remain to be seen. Further research is also needed to assess whether these interventions have been truly pro-poor, as opposed to just taking place in neighbourhoods that are generally poor.

33 It is noteworthy that although the TDAO showed an interest in these studies, it is uncertain whether they incorporated them into any long-term SWM planning.

Table 6: Contrasting success factors in Ward 7 and 12

Ward 7	Ward 12
• Lack of community involvement or understanding of project ToC at the onset, largely due to lack of support from ward level officials. • Local CSOs in the ward did not collaborate or assist with the interventions. • Lack of collaboration between local government stakeholder groups (i.e. the WWSG, ward admin, and TDAO). • Poor local governance coordination, as evidenced by the failed use of the three-wheeler donated by TDAO (no operation plan in place before purchase).	• More community involvement/'volunteering spirit' • Better communication between WSCG and local community/raising awareness. • 'quick wins' from digging flood ditches demonstrated the benefits of the approach (extremely poor neighbourhood with unpaved roads and lack of flood ditches made them highly visible). • Better coordination between local stakeholders (ward administrator and the WSCG committee chair are related).
Key differences: Pre-existing levels of social capital in the community, political support from local government officials, and frequent stakeholder communication.	

Improved stakeholder collaboration at the township level

The efforts to improve drainage in Ward 12 effectively "crowded in" efforts by other stakeholders, as the project's initial success encouraged regional MPs to reallocate budget funding for improving flood water management in the area (through the Irrigation Department). Similarly, the TDAO created synergies by repairing the piped water system where they dug ditches, and in one instance, paved over a dirt road built by the DEALS intervention with concrete. This demonstrates the importance of consistent stakeholder outreach and communication.

Key Lessons:

- Social capital and communication are vital measures of success, whether pre-existing or developed/expanded upon throughout the intervention.
- Maintain a manageable size of intervention area (i.e. ward 7 was considered too large in hindsight).
- Programme team should ensure the interest/willingness of both community members and local politicians (in particular ward administrator) before starting interventions.
- Local support and synergistic collaborations require that all stakeholders understand the project Theory of Change (ToC) before starting interventions. This should be done in tandem with developing a keen sense of local ownership over the process.

5.3 SWM priority areas

This section summarises three key areas of high priority for improving solid waste management and planning in Pathein municipality. They are based on the expertise of the authors as well as the lessons from the DEALS pilot interventions. These programme areas are relevant for both policy makers as well as development partners, and may also help inform SWM capacity development in similar contexts outside of Myanmar.

1 Composting Organic Waste

- Developing a city-wide local community composting programme can divert significant amounts of solid waste (and thus ease the burden on the TDAO for primary and/or secondary collection). If only 5 wards were able to divert half of their collected organic waste, that would reduce the municipal collection burden by 15.55 tons every single day.
- DEALS is currently piloting a composting project in Ward 12. At the time of writing, it was poised to launch ten "green stations" for collecting and composting organic waste throughout the ward, although execution had been delayed due to the covid pandemic. Importantly, responsibility for managing each composting station had already been delegated to community members, although revenue streams from fertiliser sale had not yet been identified.
- If the pilot project is successful, it can be gradually scaled up to the entire city. However, it may be necessary to create outreach campaigns to local farmers so they understand the benefits

of organic fertiliser. Research in other parts of Myanmar has shown a reluctance by smallholder farmers to switch from synthetic fertilisers – even if there is a chance of increasing output or prices of their crops – because they have extremely low risk appetite. It also remains to be seen whether small neighbourhood-based composting stations can generate relevant economies of scale (conversely, the low cost of labour in Myanmar may also enable and even smaller network, e.g. mini stations for every 100 households).

2 Waste collection improvements

- Improving waste collection management processes will enable the TDAO to do better with existing resources, including the ward-based collection system.
- Collection routes for trucks can be improved if more detailed data is collected on the exact routes taken by the trucks and how many households they actually serve. This will also enable better planning for when coverage can be expanded with more trucks.
- Route improvement must go hand in hand with developing a secondary collection system. Currently, all trucks and three-wheelers in Pathein undertake primary collection and then ferry the waste directly to the landfill. This is suboptimal and will become prohibitively inefficient if the municipality opens up a new landfill outside the city.
- VNG International and Pathein TDAO may consider collaborating with organisations such as the Asia Foundation, which has previously supported Myanmar DAOs in using GPS to track and improve waste collection routes, or they can directly learn from townships like Taunggyi which has improved its waste collection using GPS.
- Deals' efforts to expand ward-based collection systems with cheap three-wheelers has the potential to become a city-wide primary collection system. Three-wheelers are an inexpensive form of primary collection, which complement medium- to large trucks for secondary collection (i.e. where larger trucks accumulate waste at collection points and then ferry it to the landfill). A proper secondary collection system will make it cheaper to operate the extant ward-based collection system as practised in Wards 1, 3, 5, and 7 by creating efficiencies of scale, and moreover enable the TDAO to make more efficient use of their existing truck fleet. In the long run, the TDAO should consider investing in large capacity trucks for ferrying solid waste to the new landfill.
  - If the ward-based collection system is to prove efficient, DEALS should consider working with Pathein GAD in professionalising the Ward Administrator role by providing relevant training, an increase in compensation, and make it the Ward Administrator's formal responsibility to implement and/or oversee the collection system.

3 Develop better data management & KPIs

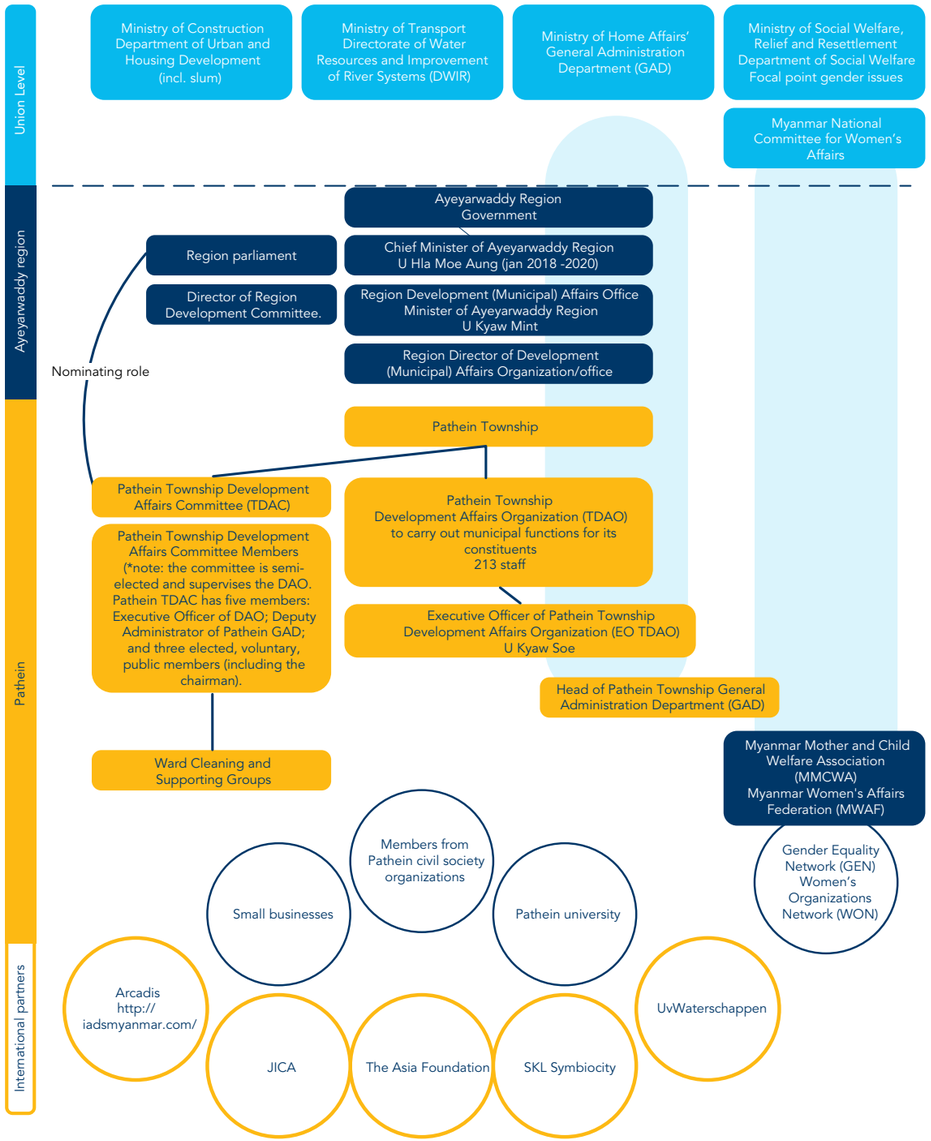
- The development of Standard Operating Procedures (SOPs) and guidelines for streamlining data collection & management will be key to monitor and evaluate SWM in the long-term. This should include official KPIs, which need to be developed at the Region level and mainstreamed for all townships. Ideally, these KPIs should be responsive to the context of each township and the data updated on a continuous basis. VNG International could work with the RDAO to support them in setting up a database and developing KPIs, although the Ayeyarwady Region parliament would need to pass relevant rules and regulations for the performance indicators to become binding.
- DEALS has developed capacity building workshops and technical reports, including a detailed municipal waste survey, to assist township-wide SWM efforts. However, it is uncertain whether this has had any impact on Pathein TDAOs governance capacity, in large part due to the relatively short timeline of the programme until now. Anecdotal evidence suggests that the TDAO does not incorporate solid waste data in municipal planning nor use any form of information technology in SWM. This is a key concern for long-term governance capacity, particularly with a view towards managing the city's rapidly increasing solid waste burden.
  - Note: a strong data-driven approach to managing solid waste issues has not been implemented anywhere in Myanmar, even at the national level, in spite of it being highly needed. Pathein township has the potential to become a pilot that – if successful – can inspire best-practices across the country for implementing the NWMSAP.

Dynamic Changes During Pilot Execution

The pilot programme conducted regular evaluations of the political economic context throughout its delivery. Such exercises are particularly important for identifying key actors and stakeholders which can improve programme delivery.

- 2019-2020: The implementing partner for module one stakeholder consultation workshop, ATAA, was later replaced by "Law Ka Ahlin" (another grassroots CSO from outside AWY) for module 2 workshops due to lack of documentation ability. However, ATAA remained involved and the change mostly related to the flood prevention components of DEALS and therefore had no impact on SWM program delivery.
- 2020: Increased political engagement
  - The Municipal Affairs Minister for Ayeyarwaddy called for increasing citizen engagement by municipal authorities at the ward level, incl. on SWM matters. This resulted several public engagement meeting by Tdao across Pathein, which led to Increased understanding of SWM issues in ward twelve.
    - The Minister had joined the 2018 study trip to the Netherlands which helped create a strong relationship between him and the DEALS program.
- 2020: Covid pandemic
  - DEALS temporarily shifted focus to implementing a public health awareness program with local stakeholders)
  - Urban poverty rates increased
  - Roll out of further interventions were delayed, although the second Deals grant was still implemented in late 2020 after the second wave.
- 2020: Proposed changes in the municipal law
  - Likely to include increased fines for littering, which Deals was consulted on. However, it is not clear whether the change would have had an impact on their work by e.g. increasing or lowering compliance.

Annex 1: Pathein City Stakeholder Map



Note: The GAD is not under the authority of the TDAO and, in most cities, has significantly more power and influence than the TDAO.

Annex 2: Pathein Property Tax Bracket

List of Property Tax rate by Pathein TDAO No./Types of building	Standard renting rate	Annual rate of property tax
1. Bamboo, leaf roof	4000 kyats to 6000 kyats[34]	800 kyats to 1200 kyats
2. Wood, leaf roof	6500 kyats to 10000 kyats	1300 kyats to 2000 kyats
3. Wood+zinc roof 1storey	11000 kyats to 15000kyats	2200 kyats to 3000 kyats
4. Wood+zinc roof 2 storeys	16000 kyats to 20000 kyats	3200 kyats to 4000 kyats
5. Brick + steel structure 1storey	20000 kyats to 30000 kyats	4200 kyats to 6000 kyats
6. Brick+ steel structure 2 storeys	32000 kyats to 35000 kyats	6400 kyats to 7000 kyats
7. Brick 1 storeys	36000 kyats to 40000 kyats	7200 kyats to 8000 kyats
8. Brick 2 storeys	46000 kyats to 80000 kyats	8200 kyats to 9000 kyats
9. Brick 3 storeys	46000 kyats to 80000 kyats	9200 kyats to 16000 kyats
10. RC 1 storey	50000 kyats to 100000 kyats	10000 kyats to 20000 kyats
11. RC 2 storeys	150000 kyats to 200000 kyats	30000 kyats to 40000 kyats
12. RC 3 storeys	250000 kyats to 300000 kyats	50000 kyats to 60000 kyats
13. RC 4 storeys	350000 kyats to 400000 kyats	70000 kyats to 80000 kyats
14. RC 5 storieys	450000 kyats to 500000 kyats	90000 kyats to 100000 kyats
15. RC 6 storeys	550000 kyats to 600000 kyats	110000 kyats to 120000 kyats
16. RC 7 storeys	650000 kyats to 700000 kyats	130000 kyats to 140000 kyats
17. RC 8 storieys	750000 kyats to 800000 kyats	150000 kyats to 160000 kyats
18. Industries	1500000 kyats to 15000000 kyats	300000 kyats to 3000000 kyats

34 At the time of writing in January 2021, US$ 1 = ca. MMK 1330.

Annex 3: Locations of Waste Storage Bins

No.	Waste Bin Location	Ward	Number
1.	GEC street	Ward 2	1
2	In front of Win Shwe War (Strand road)	Ward 2	1
3	Thein daw kyi street	Ward 3	1
4	Kan Pat street	Ward 3	1
5	Pyi daw thar housing	Ward 4	1
6	Taung Gone	Ward 4	1
7	Pyi daw thar Ma Yan Cho street	Ward 5	1
8	Nat Sin street	Ward 5	1
9	Katta street (strand road)	Ward 6	2
10	Yawe Bo Tat street (strand road)	Ward 6	1
11	Bo ba htay street	Ward 6	1
12	Kin Ma Lin Kyun beside railway	Ward 13	1
13	Shwe Wut Hmone	Ward 13	1
14	Myat To	Ward 13	1
15	Bus station	Ward 13	1
16	Rail station market	Ward 14	1
17	General hospital	Ward 4	1
18	Whole sale compound	Ward 2	1
19	Tar Wa Tain Thar street	Ward 3	1

List of Acronyms

DAO	Development Affairs Organisations
DEALS	Governance of Inclusive Green Growth in Cities
DOF	Department of Fisheries
DRD	Department of Rural Development
DRI	Department of ???
ECD	Environmental Conservation Department
GAD	General Administration Department
GDP	Gross Domestic Product
IRD	Internal Revenue Department
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicator
MMK	Myanmar Kyat (currency)
MOALI	Ministry of Agriculture, Livestock and Irrigation
MPI	Multidimensional Poverty Index
MONREC	Ministry of Natural Resources and Environmental Conservation
NWMSAP	National Waste Management Strategy and Action Plan
PCD	Pollution Control Division
RTDAO	Regional Township Development Affairs Office
SDGs	UN Sustainable Development Goals
SOP	Standard Operating Procedure
SWM	Solid Waste Management
TDAO	Township DAO Office
TDAC	Township Development Affairs Committee
WWSG	Ward Welfare & Support Group

VNG International

VNG International are experts in strengthening local government in developing countries and countries in transition. Local governments play a key role in the provision of basic services including water, waste management, health care and housing. They have a profound impact on areas such as safety, food security, rule of law and women's rights. This is how our projects contribute in a sustainable way to better futures for people, communities and countries.

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